Comments on Storage Bid Cost Recovery and Default Energy Bids

July 8, 2024 Workshop

Department of Market Monitoring

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DMM appreciates the opportunity to comment on the July 8, 2024 workshop on Storage Bid Cost Recovery and Default Energy Bids.[1]

Summary

Bid cost recovery (BCR) payments are an important part of market pricing and settlements. These payments are intended to support efficient dispatch and bidding, and are typically removed under circumstances where they would not support efficient dispatch and bidding. For example, when resources submit outages or self-schedules that force the optimization to schedule resources regardless of market prices, resources are generally ineligible for bid cost recovery resulting from those resource conditions.

Batteries do not have the unit commitment and dispatch limitations that drive the need for most BCR payments for other resource types. Meanwhile, batteries are also subject to operational constraints that do not impact other resource types, such as state of charge (SOC). To help allow battery operators more control over how batteries are dispatched, the ISO has added an array of special software limitations that can be set by battery operators that do not exist for other resource types. These additional constraints and parameters can force the market optimization to dispatch batteries without regard to bid and market prices. However, the ISO's current BCR rules were not designed for batteries and do not consider the ways in which these constraints and parameters may impact the dispatch of a battery resource.

A large majority of BCR paid to batteries is the result of constraints and parameters unique to batteries. Further, much of this BCR appears to be inconsistent with the objective of supporting efficient bidding and dispatch. Therefore, instead of looking for cases to exclude from the current BCR calculation for batteries, the ISO should consider identifying cases where paying BCR to batteries would support efficient dispatch, and developing rules targeted at paying BCR to batteries only in those cases.

Battery resources control multiple parameters that can greatly affect their schedules

The CAISO market has several constraints and parameters to help battery resources manage their market schedules. Battery resources are commonly modeled using the non-generator resource (NGR) model, which models a battery's state-of-charge (SOC) and considers this operating constraint in market awards. Market participants can submit various constraints on SOC through SIBR, OMS, MasterFile and

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[1] *Storage Bid Cost Recovery and Default Energy Bid Enhancements*, California ISO, July 8, 2024: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Bid-Cost-Recovery-and-Default-Energy-Bids-Enhancements-Jul-8-2024.pdf

telemetry data that allow them to potentially exercise significant control over how the market schedules batteries. These constraints include:

- minimum and maximum SOC parameters submitted as part of the bidding process,
- minimum and maximum SOC entered through OMS cards,
- end-of-hour SOC real-time bid parameter,
- day-ahead initial SOC bid parameter,
- telemetered SOC values that are calculated by the battery operator and passed to the ISO for use in market optimization.

Intervals impacted by some SOC constraints under battery operator control, such as the end-of-hour SOC constraint, are excluded from BCR eligibility. This BCR rule was developed in conjunction with the constraint, recognizing that the use of this constraint is analogous to self-scheduling. However, for many other SOC constraints, existing BCR rules do not consider the limitations these constraints may place on resources, and the control over market dispatches that these constraints provide for battery operators. This control can allow participants to essentially self-schedule or derate their resources, but still receive bid cost recovery (BCR) payments because the settlements process does not see the energy as self-schedule or derate energy.

Additionally, because of the intertemporal dependencies of SOC constraints on batteries, bidding by battery operators can directly impact the ability of a battery to operate in future hours or intervals. Therefore, bids submitted by battery operators can also limit the resource's SOC in future intervals. Under current rules, resources are eligible for BCR associated with SOC constraints that result from earlier market bidding and dispatch patterns. This design is the leading cause of real-time bid cost recovery for batteries, when a binding SOC limitation prevents real-time deliverability of day-ahead schedules. The current design also has reliability and efficiency implications that must be considered, as described below.

Current BCR rules create reliability and efficiency concerns in addition to inflated BCR payments

While there is a concern that battery resources could use the parameters they control to profit from inflated BCR payments, this is not the only concern. Current market rules for battery BCR also have reliability and efficiency implications.

When a battery has a day-ahead schedule to discharge or charge, there is a tradeoff between operating as scheduled in day-ahead and operating earlier than scheduled. f the battery discharges (or charges) energy early, it will not be able to discharge (or charge) in alignment with its day-ahead schedule.

Consider a battery with a day-ahead schedule to discharge during peak net load hours. If real-time prices before these hours are higher than real-time prices during the hours of the day-ahead discharge schedule, the battery makes more money on its early discharge than it pays to buyback the day-ahead schedule. On its own, this outcome is efficient, and battery operators would be expected to seek this outcome by incorporating these potential intraday opportunity costs in real-time bids.

If real-time prices before the day-ahead schedule are less than real-time prices during the day-ahead schedule, the battery would lose money by discharging early. However, the current BCR design erases that loss. The battery operator has no incentive to include intraday opportunity costs in its bids, or to avoid a discharge before its day-ahead schedule that could create a loss. Instead, the battery has an incentive to discharge before its day-ahead schedule regardless of expected real-time prices in the hours of the day-ahead schedule. The battery operator can bid in a way that the battery cannot be worse off, and may profit from discharging earlier than would be optimal based on expected real-time prices.

Similarly, if real-time prices before a day-ahead charging schedule are lower than real-time prices during a day-ahead charging schedule, the battery would be better off by charging early at the lower price and selling back the day-ahead schedule. They would profit from this real-time schedule change. Again, on its own this would be fine. But because the BCR hedges potential losses, the battery would not lose money by charging early when real-time prices before the day-ahead schedule are more than the real-time prices during a day-ahead schedule.

A battery can make money from discharging or charging early, but it cannot lose money from discharging or charging early.[2] Real-time BCR payments detach the battery's incentives from the incentives of the real-time market prices—the opposite of the purpose of BCR payments. A battery instead can have an incentive to submit bids and parameters so that the real-time market will discharge (or charge) it before its day-ahead schedule.

Further, batteries are generally scheduled in the day-ahead to discharge during the peak net load hours with the highest prices of the day, which coincides with the hours in which energy from batteries is most needed for system reliability. So the incentive to discharge early is an incentive to not be available in real-time, when the discharges are likely most needed for both market efficiency and system reliability. This creates a clear operational concern that could increase the need for manual interventions by ISO operators.

Calculating BCR payments using default energy bids would not address underlying issues

One potential solution proposed to address BCR concerns for batteries is to settle BCR based on default energy bids (DEBs). This solution may be effective at reducing the amount of BCR paid out in some situations, but would be less effective in others. Further, settling BCR on DEBs does little to address the efficiency and reliability issues created by paying BCR for buyback or sellback of undeliverable day-ahead schedules.

Settlements calculates bid cost recovery payments using both bid costs and market revenues. Altering bids can inflate BCR payments. However, the primary driver of BCR payments for day-ahead discharge schedule buybacks is the revenue side of the calculation. Therefore, settling based on DEB would have limited impact on reducing the associated BCR payments.

A DEB-based BCR settlement would be more effective at reducing BCR associated with sellbacks of undeliverable day-ahead charging schedules. However, in neither case does settling BCR based on DEB provide the full incentive to avoid early dispatch before a day-ahead schedule, and consider intraday opportunity costs based on expected real-time prices. Any amount of BCR paid when day-ahead schedules are undeliverable due to SOC limitations prevents exposure to real-time prices in hours of day-ahead schedules.

[2] Conditional on not submitting real-time bids that would create a loss.

Bidding incentives are changed by removing BCR payments when state-of-charge constraints bind

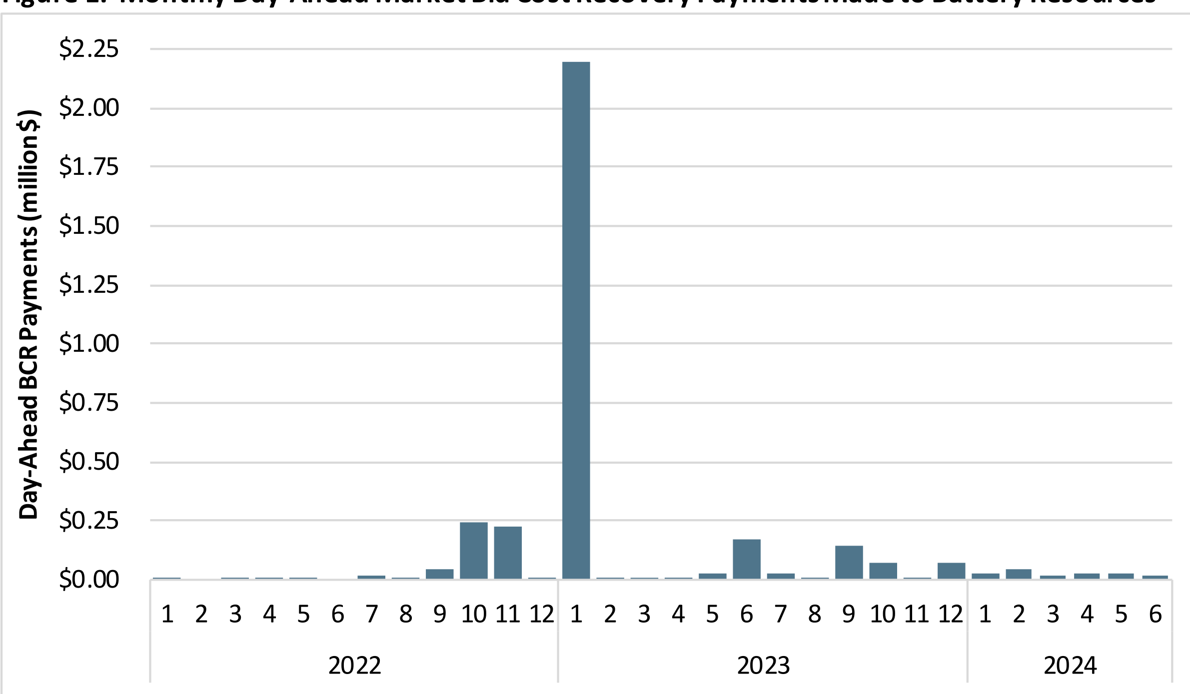
Some stakeholders noted on the call that BCR payments are an after-market calculation, and that removing eligibility for BCR payments when the state-of-charge constraint is binding will not impact distorted bids in the market or their effects on market prices. DMM believes this is incorrect. The knowledge of BCR eligibility in certain scenarios provides clear and consistent incentives to submit bids that may be distorted and may not align with marginal cost. Market rule changes that remove BCR eligibility in certain scenarios also removes the related incentives to submit distorted bids. Therefore, DMM believes the ISO's suggested approach does mitigate the incentive to submit distorted bids, and the effects of such bids on market prices.

The need for day-ahead battery BCR payments has not yet been shown

In a presentation at the July 8, 2024 workshop, DMM suggested that the ISO consider eliminating day-ahead BCR for batteries. This recommendation is fundamentally the same as DMM's recommendation to eliminate most real-time BCR for batteries, except for specifically identified instances where real-time BCR for batteries may be warranted. DMM, the ISO, and stakeholders agree that there may be such instances for real-time. However, in day-ahead, the need for battery BCR has not been demonstrated, and the nature of the 24-hour integrated forward market (IFM) optimization makes the need for battery BCR much less likely.

Day-ahead BCR paid to batteries since January 2022 has been minimal, with a few exceptional cases driven by participant-submitted parameters. Figure 1 below shows day-ahead BCR payments to batteries between January 2022 and June 2024.

Figure 1. Monthly Day-Ahead Market Bid Cost Recovery Payments Made to Battery Resources



The large BCR payments in late 2022 and early 2023 were driven by participant-submitted parameters that forced the day-ahead market to schedule batteries to maintain feasible states-of-charge, regardless of market prices. A large majority of non-trivial day-ahead BCR payments since January 2022 were driven by participant parameter submissions that had an effect equivalent to self-scheduling. Total day-ahead BCR payments to *all* batteries from February 2023 through June 2024 has averaged about $41,000 per month ($27,000 per month in 2024 or less than $1,000 per day). DMM checked several instances of BCR with more trivial amounts, e.g., instances with a few hundred dollars of BCR for a day. Such instances are the overwhelming majority of cases where batteries receive day-ahead BCR. DMM did find an example of BCR payments that appears to not be directly driven by parameters submitted by the market participant. The BCR in this example occurred because total regulation capacity and mileage payments were lower than total regulation capacity and mileage bid costs. However, it is not clear to DMM if this is an issue with the pricing of the mileage product itself, or an issue with the settlements calculation of BCR with respect to mileage revenues and costs.

The ISO should determine if there are any issues with regulation and mileage pricing that may need to be addressed. Addressing any such issues would be the preferred solution. However, if such issues are identified and left unresolved, the small day-ahead BCR payments associated with regulation and mileage could be warranted. Eliminating other drivers of day-ahead battery BCR may still be appropriate unless demonstrated otherwise.

While analysis of recent data suggests limited need for day-ahead battery BCR, the possibility of legitimate reasons for a battery to receive day-ahead BCR payments cannot be entirely eliminated. If such reasons are demonstrated, then the settlement rules should allow for BCR payments in those circumstances. However, DMM recommends a starting point of no day-ahead battery BCR. From that point, the ISO could consider allowing day-ahead battery BCR in targeted cases if there is a specific demonstrated need.

Battery DEBs should accurately reflect real-time intraday opportunity costs

Real-time intraday opportunity costs in a given hour are driven by expected real-time prices in later hours. These costs can reflect either the expected value of foregone future discharge opportunities, or the expected cost of buying back an undeliverable day-ahead schedule if discharged early.

As noted above, allowing BCR for real-time buyback of undeliverable day-ahead schedules removes economic incentives to reflect expected real-time intraday opportunity costs in energy bids earlier in the day. The current BCR design prevents battery operators from being exposed to intraday opportunity costs that arise from any expected loss associated with buying back an infeasible day-ahead schedule.

Without real-time BCR payments that cover losses from day-ahead schedule buybacks or sellbacks when SOC constraints are binding, batteries need to manage the risk of losses with bids. The bids would also serve as the primary way for the real-time markets to have information on the opportunity costs of charging or discharging in intervals before the day-ahead schedules (particularly if the day-ahead schedules are in intervals beyond the advisory interval lookout). Therefore, battery DEBs would also need to allow this cost in the intervals *leading up to* the day-ahead schedules.

The current design for battery default energy bids may be sufficient in some instances. However, in real-time, these DEBs are based on day-ahead prices and may be insufficient to capture intraday opportunity costs associated with potentially higher real-time prices. Further, the current DEB design is a static value over all hours of the operating day and does not consider changing intraday opportunity costs throughout the day. This can lead to a DEB that is too high in some hours, and too low in other hours. DMM recommends the ISO develop hourly DEBs that would allow the DEBs to be higher in the intervals leading up to the peak pricing hours, and lower in later intervals as intraday opportunity costs fall.